INSTRUCTION MANUAL

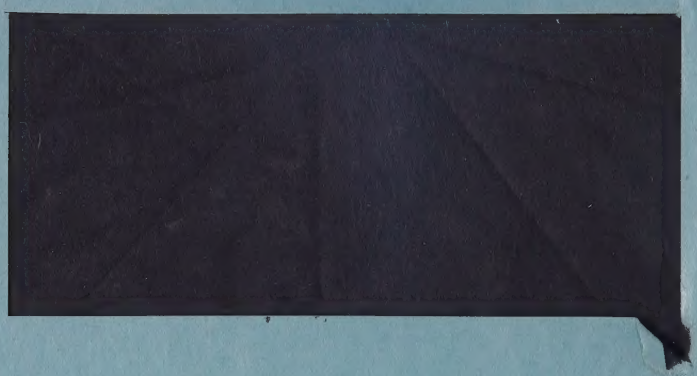
FOR

PRECISION DC VOLTMETER

MODEL DC-200AR-1

ELECTRONIC INSTRUMENTATION FOR INDUSTRY

CALIBRATION STANDARDS CORPORATION *a subsidiary of* ROYAL INDUSTRIES, INC.



PRECISION DC VOLTMETER

MODEL DC-200AR-1

SERIAL # SP-194

CALIBRATION STANDARDS CORPORATION
ALHAMBRA, CALIFORNIA

CUmberland 3-8156

CS4-501

Issued

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IMPORTANT

FOR OPTIMUM RESULTS READ THIS INSTRUCTION MANUAL CAREFULLY

The instrument covered in this manual is of an advanced design in the field of transistorized precision test equipment.

You will find this instrument has many distinct advantages over the operating characteristics found in equipment costing many times as much.

Since this instrument incorporates advanced engineering techniques and design, it is imperative that you become familiar with the proper operating procedure.

One of the superior features found in this instrument is the elimination of the usual electronic zero controls. The meter need only be zeroed by the mechanical adjustment screw on its case while the instrument is in operation.

The meter zeroed in this manner, may show an offset of the needle from zero when the instrument is turned off. This is normal. (The mechanical zero of the meter deviates slightly from the instrument's electrical zero.)

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OPERATING INSTRUCTIONS

1. The line cord should be plugged into a 117 volt 60 cycle power source.
2. Turn the null selector to the VTVM position. Let warm up for about ten minutes.
3. After warm up period, adjust meter to zero by mechanically adjusting the screw in the center of the meter case.
4. Turn the range selector knob to the desired range. Connect the voltage to be measured to the terminal posts. Either positive or negative may be grounded to the common terminal. If desired, the input may be left floating above ground.
5. The voltage now indicated on the meter is accurate within 4%. It is providing typical VTVM measurements. If the meter needle swings to the left, reverse the input connections.
6. Position first two readout dials to the approximate VTVM voltage reading. Advance the null selector knob to the 1 V position. Continue to adjust the readout while increasing the null sensitivity. You are now zeroing in on the null.
7. When, by the procedure above, the null selector is at full sensitivity (1 MV) and the meter reading zero, the voltage now read from the dials is accurate to better than .01% plus 5 microvolts absolute. You may not get a reading of zero if the voltage you are measuring is not constant and fluctuating.

Operating Instructions - (Cont'd.)

READING EXCURSIONS ABOUT A NOMINAL VOLTAGE

8. To read excursions of voltage about a nominal value, set the readout dials to the nominal value. Excursions may be observed directly on the meter on any of the four null ranges. A right hand deflection of the meter indicates the voltage has increased above the nominal value by the amount indicated on the meter. For voltages read on the 10 volt range and below, use null sensitivity selector as marked. On the 100 volt ranges, the null sensitivity selector value must be multiplied by a factor of 100.

DIRECT MEASUREMENTS OF 10 VOLTS AND ABOVE

9. With the range selector in the 10 volt position, use full scale values as marked on the meter. When range selector is in the 100 volt position, multiply the meter reading by 10. On the 1000 volt range, multiply the reading by 100.

VARIATIONS IN NULL DETECTOR SENSITIVITY

9A. Due to the circuit design on the 100 volt range, the null detector will have reduced sensitivity on the 1 mv and 10 mv position. This is due to a high internal source impedance of the high voltage input divider. The sensitivity is about 50%

Operating Instructions - (Cont'd.)

less in the 1 mv null position and about 15% less on the 10 mv position. Only a very slight loss of sensitivity is noticed on the other null ranges.

When the range selector is in the 1000 volt position a 10% loss of sensitivity will be noticed in the 1 mv position. The other null ranges will have only a very slight loss of sensitivity.

MEASUREMENTS BELOW 1 VOLT IN DIFFERENTIAL MODE

10. When making measurements below 1 volt, turn Range Selector switch to the 1 volt position; set null selector to the 1 mv position; set all readout dials to zero and short positive and negative input terminals together.

11. Now set the mechanical meter adjustment to zero. This will cancel out error due to zero offset between the 1 millivolt range and the V.T.V.M. range. Remove short across terminals and proceed with the reading of voltage per paragraphs 4, 5, 6, and 7.

CIRCUIT DESCRIPTION

This Calibration Standards Voltmeter is completely transistorized and designed for long trouble free life. There are no batteries or components that would normally need replacing, except the electro-mechanical chopper.

This dependable voltmeter operates on the principle of comparing an unknown voltage with an adjustable known voltage. A sensitive null detector is used to provide a means of sensing when the known and unknown voltages are equal.

This Calibration Standards voltmeter is composed of three (3) basic elements:

(1) Ultra Stable Reference Supply

(2) Accurate Kelvin Varley Divider

(3) Sensitive Null Detector

1. The heart of the voltmeter is the ultra stable reference voltage supply. This supply is a dual regulated transistor supply powering a compensated Zener reference string. The regulation for a 10% line change is better than -.001%. The temperature coefficient of the reference supply is better than .0002%/^{o} C. over a temperature range of 10^{o} C to 40^{o} C. The supply is usable above 40^{o} C with a slight derating of TC and line voltage regulation. Long term stability of the reference supply is

Circuit Description - (Cont'd.)

approximately ±.001%/year. This reference voltage supply is constructed as a plug-in module. Spares and replacements are available from the factory. When ordering be sure to indicate the serial number of the instrument.

2. The second basic element is the very accurate Kelvin Varley Divider. The first three decks are composed of 11 precision wire wound resistors per deck.

   The first deck has resistors matched to -.001% and the second and third decks have resistors matched to ±.003%. The last three readouts are accomplished with a selected precision 10 turn potentiometer. The linearity of this potentiometer is better than ±.05%. The two decks and the 10 turn potentiometer are matched together to produce an over-all divider accuracy better than ±.002% absolute. A calibration curve is provided showing the exact linearity of the Calibration Standards Kelvin Varley Readout. (See Drawing Number A-1071).

   The range selector precedes the Kelvin Varley Divider. Each range has a fine adjustment potentiometer for calibration; each is calibrated separately. The 10 volt range must be calibrated first.

3. The third element is a very sensitive and stable calibrated null

Circuit Description - (Cont'd.)

detector. This null detector is used to indicate the difference between the unknown external voltage and known internal voltage. At maximum sensitivity the null detector has a full scale deflection of 1 mv. This provides ample sensitivity for accurate low level voltage measurements. The VTVM accuracy is ±4% of full scale over a temperature range of 20° C to 30° C. The instrument is usable to 40° C. but some derating should be considered.

It is not recommended that the instrument be operated above 45° C.

The null detector is capable of a long trouble free life except for the occasional replacement of the chopper. These are highly reliable, however, do occasionally need replacement. These are available from stock at the factory. The occasional calibration of the null detector may be made by adjusting the gain adjustment potentiometer at the top of the plug-in amplifier module.

The null detector is capable of large overloads without damage. On the 1 mv range a safe overload would be 50 volts short term and 10 volts long term. On the 10 mv, 100 mv, and 1 V positions, a safe overload of 500 volts is possible.

Circuit Description - (Cont'd.)

In the VTVM position ranges, safe overloads are as follows:

1	volt range:	70	volts
10	volt range:	250	volts
100	volt range:	700	volts
1000	volt range:	1500	volts

CALIBRATION OF DC-200AR

Diagram A 1078 in this manual shows a setup for calibrating the DC-200AR Voltmeter.

A. Calibration of the Differential Section

The "RANGE SELECTOR" - "10V" and "1V" ranges are calibrated first. On these ranges the instrument has an infinite input resistance at null.

1. Turn instrument on and let warm up for about 30 minutes.

2. Next, turn "NULL SELECTOR" to the VTVM position and zero the meter by the mechanical adjustment screw on the meter.

3. Apply a known 10-volt calibration voltage across the "POS" and "NEG" input terminals. The instrument meter should read full scale. (See Drawing Number A-1078). Turn "READOUT" dials to read 999100 and turn "NULL SELECTOR" switch to the "1 MV" position. Bring meter to zero by adjusting the appropriate calibration trim potentiometer. (See Drawing Number A-1071).

4. Repeat the basic procedure for calibration of the "1 V" range using a known 1 volt.

Calibration of DC-200AR - (Cont'd.)

The "RANGE SELECTOR" - "100V" and "1000V" ranges are calibrated next. On these ranges the instrument has a 2 megohm input resistance.

5. Turn the "RANGE SELECTOR" switch to the "100V" position and apply a known 100 volt calibration voltage at meter input. Continue basic calibration procedure outlined in paragraph 3.

   NOTE: Multiply "NULL SELECTOR" ranges by 10.

6. Turn the "RANGE SELECTOR" switch to the "1000V" position. Apply a known 500 volts with the "READOUT" dials turned to 500.000. Bring meter to zero by adjusting the appropriate trim potentiometer.

B. Calibration of the VTVM Ranges

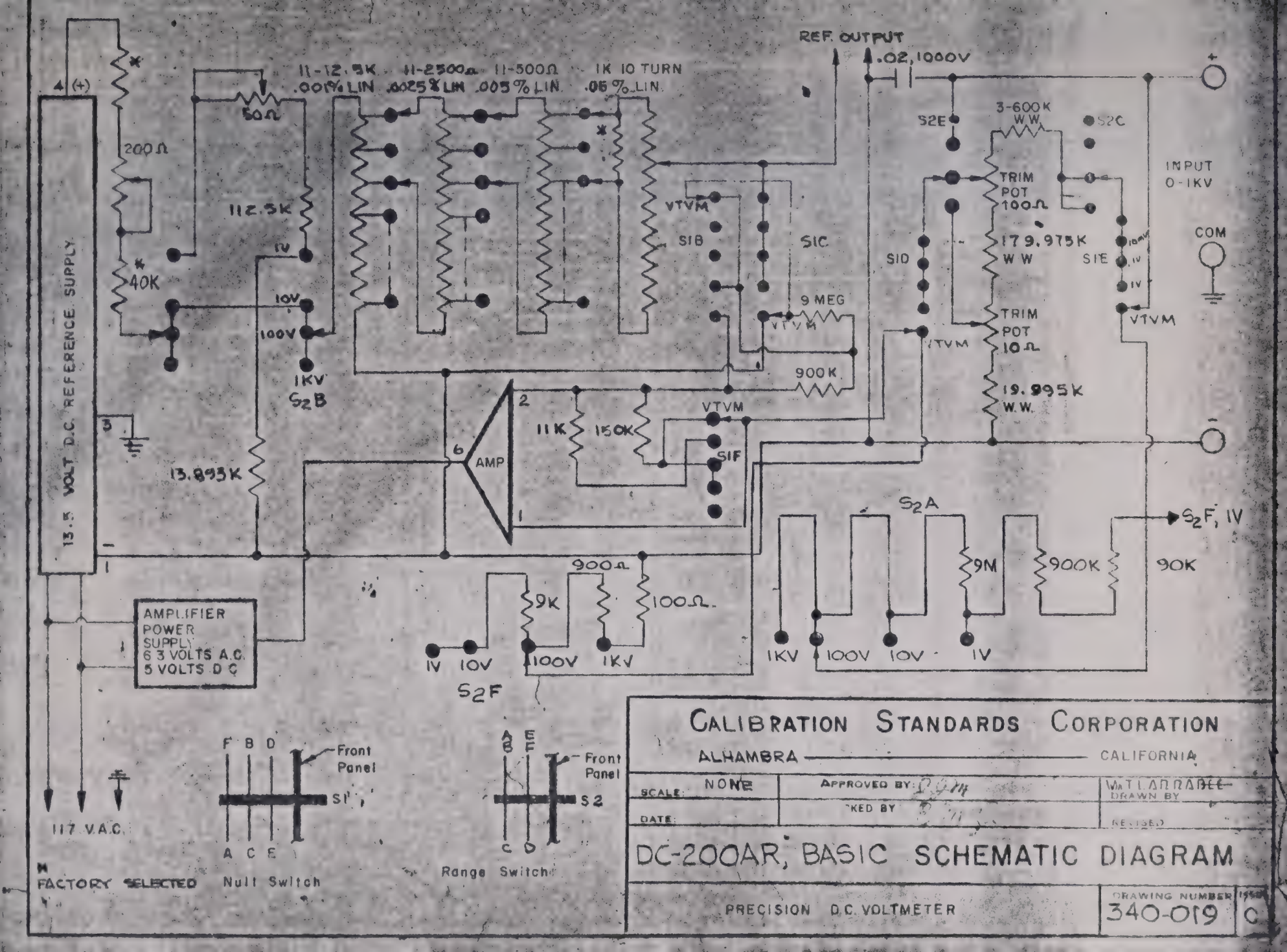
Calibrate the VTVM Ranges by setting the "RANGE SELECTOR" switch to the "10V" position and apply a known 10 volt calibration voltage. Adjust the potentiometer at the top of the amplifier plug-in module for full scale deflection. It is not necessary to calibrate the remaining VTVM ranges.

WARRANTY

The CALIBRATION STANDARDS CORPORATION warrants each instrument to be free from defects in material and workmanship. Material not covered by this warranty are fuses and choppers. The instrument must be returned to the factory with shipping prepaid and a complete report of the difficulty. This warranty is good for one year from the shipping date.

SHIPPING DAMAGE

If there is any damage to the instrument upon receipt, report this to the transportation Claim Agent immediately.



CALIBRATION STANDARDS CORPORATION

ALHAMBRA — CALIFORNIA

SCALE: NONE	APPROVED BY:	DRAWN BY:
DATE:	CHECKED BY:	REVISED

DC-200AR, BASIC SCHEMATIC DIAGRAM

PRECISION D.C. VOLTMETER

DRAWING NUMBER 340-019 C

DWG. NO.	ISSUE
340-029	B

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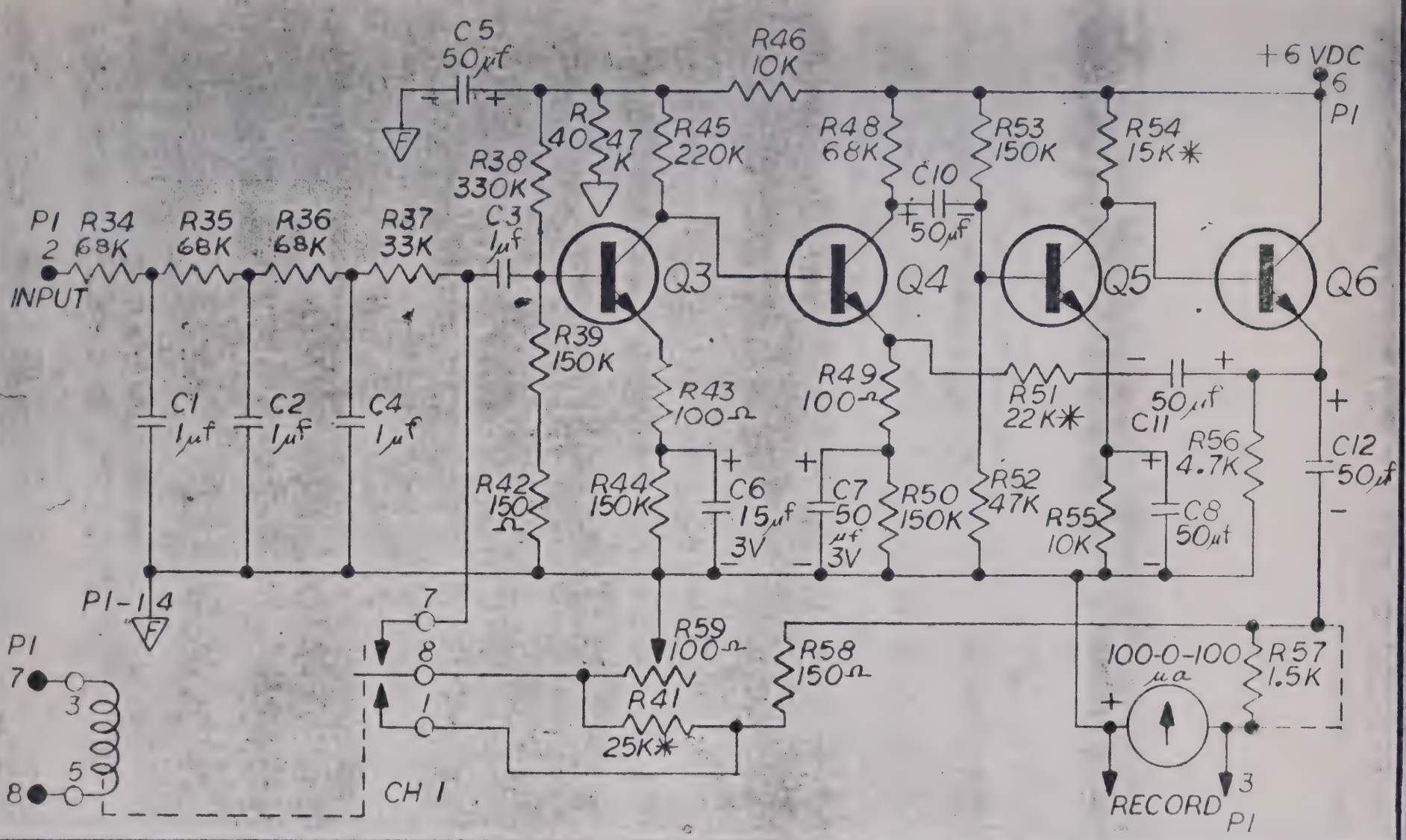
CHANGE	DATE	ISSUE	BY	APP.



* VALUE MAY CHANGE FOR DIFFERENT GAIN.

TOLERANCES: EXCEPT AS SHOWN:	DATE: 6-18-62
FRACTION ±	DWN: CA BIBB
DECIMAL ±	CHKD:
ANGLES ±	APPD: H. L. Fox
	SCALE:

CALIBRATION STANDARDS CORPORATION

POMONA — CALIFORNIA

TITLE: SCHEMATIC AMPLIFIER NO. 4

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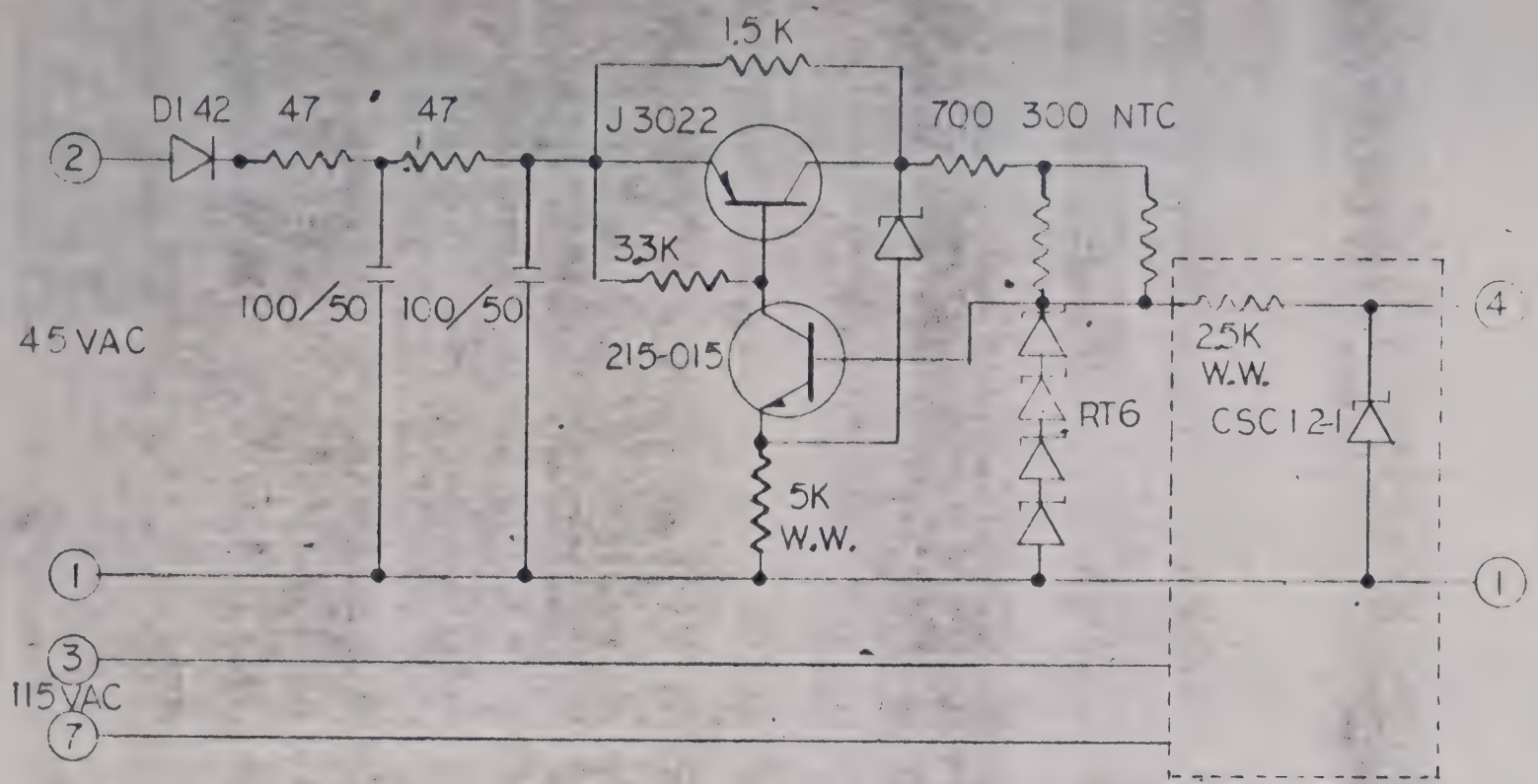

MATERIAL	QTY.	TOLERANCES. EXCEPT AS SHOWN: FRACTION ± DECIMAL ± ANGLES ±	DATE: 9/27/62 DWN: D.L.W. CHKD: DL W. APPD: D.L.W. SCALE:	CALIBRATION STANDARDS CORPORATION POMONA — CALIFORNIA	
				TITLE: OVEN REGULATOR REFERENCE	
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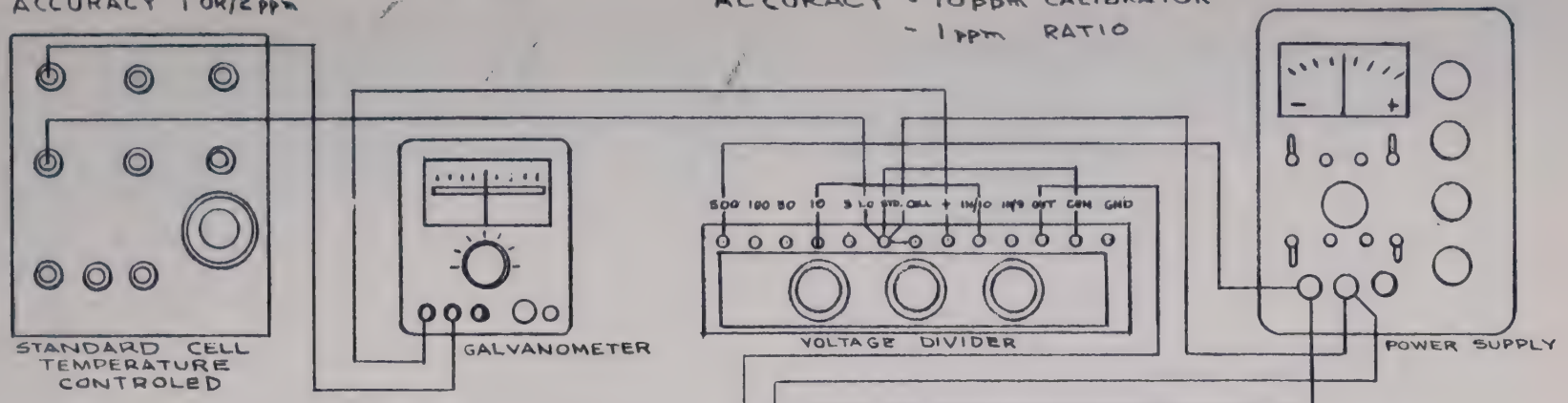
CHANGE	DATE	ISSUE	BY	APP.

JULIE RESEARCH LABS
MODEL 500-106
ACCURACY 1 OR/2 ppm

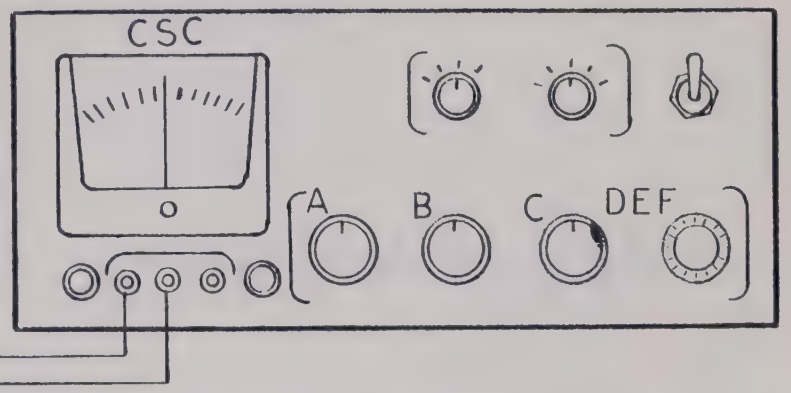
HP425AR

JULIE RESEARCH LABS
MODEL VRS-105/6
ACCURACY - 10ppm CALIBRATOR
- 1ppm RATIO

KIN TEL
MODEL 301


500 100 50 10 5 1.0 STD. CELL + IN/10 IN/0 OUT COM GND
STANDARD CELL TEMPERATURE CONTROLED
GALVANOMETER
VOLTAGE DIVIDER
POWER SUPPLY

CSC MODEL DC-200AR OR/ RV-200AR



SETTINGS	VRS-105	RATIO	301
500V	500V	NOT USED	500V
100V	100V	NOT USED	100V
10V	10V	NOT USED	10V
1V	5V	.2V	5V

NOTE: THE TWO LEFT HAND DIALS ON THE VRS-105/6 ARE USED TO DIAL OUT THE CORRECT STANDARD CELL VOLTAGE. THE REMANING DIAL IS FOR RATIO VOLTAGES

1VOLT WHEN VRS-105/6 IS SET FOR 5VOLTS AND RATIO SIDE IS SET FOR 10:1

DET.	MATERIAL	QTY.

TOLERANCES: EXCEPT AS SHOWN:
FRACTION ±
DECIMAL ±
ANGLES ±

DATE: 12-26-60
DWN: WJF
CHKD:
APPD:
SCALE:

CALIBRATION STANDARDS CORPORATION
ALHAMBRA — CALIFORNIA

TITLE: AC/DC/RV-200AR, CALIBRATION —

NEXT ASSEMBLY:
USED ON:

DRAWING NO. 340-027 | ISSUE A

DWG NO	ISSUE		CHANGE	DATE	ISSUE	BY	APP
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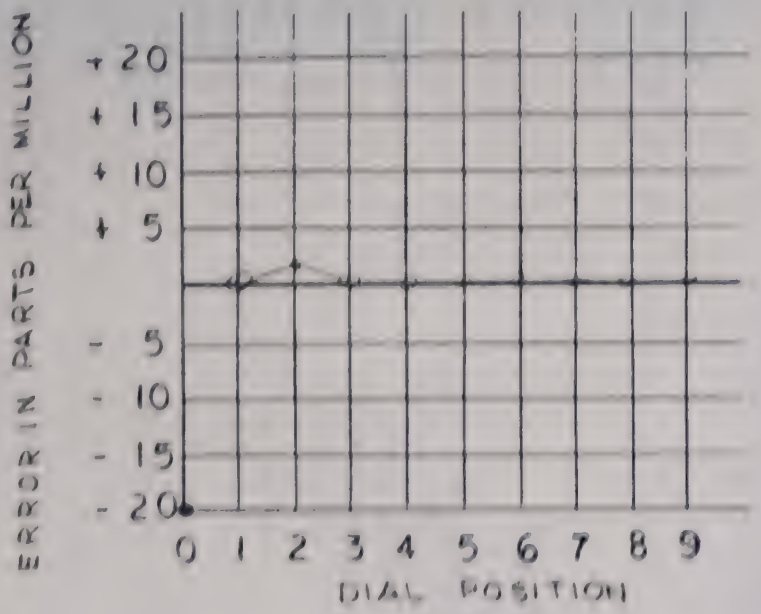
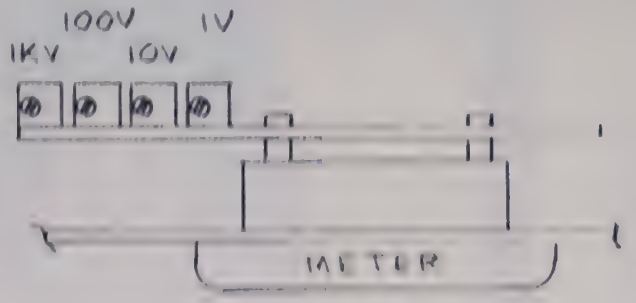


CALIBRATION ADJUSTMENTS



INSTRUMENT SERIAL # SP 154

KELVIN VARLEY DIVIDER CALIBRATION
CHECKED AGAINST OUR 1 PPM MASTER DIVIDER

QTY	MATERIAL	QTY	TOLERANCES EXCEPT AS SHOWN: FRACTION ± DECIMAL ± ANGLES ±	DATE: DWN: CHKD: APPD: SCALE:	CALIBRATION STANDARDS CORPORATION POMONA — CALIFORNIA TITLE: DC200-AR CALIBRATION CHART NEXT ASSEMBLY: USED ON: DRAWING NO. 340-023 ISSUE N/C

Calibration Standards Corporation

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Model DC-200AR
VOLTMETER
Model RV-200AR
RATIOMETER - VOLTMETER

PRECISION DC VOLTMETER

FULLY TRANSISTORIZED

ACCURACY

±0.01% + 5 microvolts absolute from 0 to 1000 volts D.C.
±0.003% typical accuracy

STABILITY

±.001% for a 10% line voltage change.

- **Transistorized throughout, no vacuum tubes or batteries.**
- **6 digit readout.**
- **10 ppm/year stability of wire wound resistors.**
- **10 ppm/year stability of Zener reference supply.**
- **Recorder Output (25mv).**
- **0-10 volts output from Kelvin Varley divider.**

GENERAL DESCRIPTION

The Model **DC-200AR D.C. VOLTMETER** is designed to measure D.C. voltages to an accuracy of better than ±0.01%. Below 10 volts the instrument has an infinite input resistance at null. Above 10 volts the input resistance is 2 megohms.

This instrument provides 6 digit readout with near infinite resolution.

The Model RV-200AR is identical to the DC-200AR except that D.C. ratio measurements can also be made.

Calibration Standards Corporation

A subsidiary of ROYAL > INDUSTRIES, INC.

ELECTRONIC INSTRUMENTATION FOR INDUSTRY

PRECISION D.C. VOLTMETER

DC-200AR
RV-200AR

MODELS DC-200AR - RV-200AR

VOLTMETER RATIOMETER - VOLTMETER

SPECIFICATIONS

DC-200AR VOLTMETER

VTVM RANGES	0-1v., 0-10v., 0-100v., 0-1000v. full scale.
NULL RANGES	0-1mv., 0-10mv., 0-100mv., 0-1 volt full scale. (Times 10 on the 100 volt range.) (Times 100 on the 1000 volt range.)
ACCURACY of PRECISION RANGES	±0.01% + 5 microvolts absolute from 0 to 1000 volts D.C.
POTENTIOMETER ACCURACY	±0.002%.
ACCURACY of VTVM	±4% of full scale.
INPUT RESISTANCE	Infinite at null below 10 volts, 2 megohms above 10 volts. VTVM Resistance — 1000 volts, 100 volts, 10 volts } 10 megohms 1 volt — 1 megohm 100 megohms/volt on null ranges except 1 volt null range — 10 megohms. When KVD dials set to zero.
STABILITY of REFERENCE	±0.001% for a 10% line change. ±0.0002% (2 PPM)/°C over a temperature range of 10°C to 40°C.
WARMUP	Less than 10 min. for 0.02% accuracy. Less than 30 min. for 0.01% accuracy.
INPUT LINE VOLTAGE	117 v.a.c. 60 c.p.s. — 50-400 c.p.s. operation is available for all instruments for an additional $60.00.
INPUT POWER	Less than 3 watts.
WEIGHT and SIZE	12 Lbs. 19"w. x 7"h. x 6"d.
PRICE	Rack Model $985.00. Cabinet Model $965.00 F.O.B. Alhambra, California.

RV-200AR RATIOMETER - VOLTMETER

VOLTMETER SPECIFICATIONS	Same as DC-200AR.
RATIO RANGES	x1 = 1:1 to 10:1. x10 = 10:1 to 100:1. x100 = 100:1 to 1000:1.
RATIO ACCURACY	±0.005% + 5 microvolts for ratio of 1:1 to 1000:1 over a voltage range of 0-300 volts D.C.
PRICE	Rack Model $1145.00. Cabinet Model $1125.00 F.O.B. Alhambra, California.

The **MODEL DC-200AR** and **MODEL RV-200AR** are very precise measuring instruments. Only the highest stability precision wire wound resistors are used in critical circuits. These resistors are stable to ±10 ppm/year due to our long term temperature cycling. The Zener reference supply is stable to approximately ±10 ppm/year. The Zener reference elements are aged for 1000 hours before installation into the instruments.

The **MODEL RV-200AR** measures both D.C. voltages and D.C. ratios. Both instruments offer 6 digit readout.

Calibration Standards Corporation

1031 WESTMINSTER AVENUE
POST OFFICE BOX 551
ALHAMBRA, CALIFORNIA

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PRECISION ELECTRONIC INSTRUMENTS FOR INDUSTRY

AC/DC VOLTMETER MODEL AC-200AR

AC/DC CONVERTER MODEL C-100AR

DC VOLTAGE CALIBRATOR MODEL VC-200A

DC VOLTMETER MODEL DC-100A

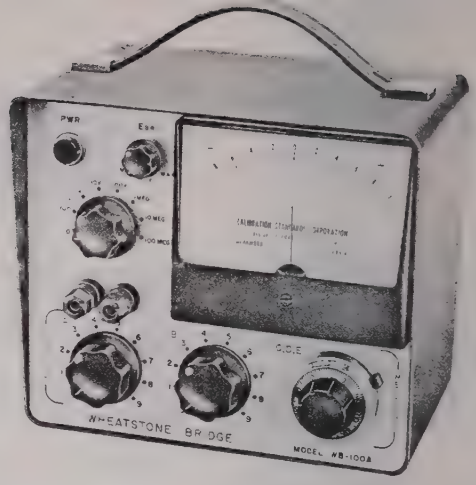
DC VOLT-AMP METER MODEL VA-100A

AC/DC VOLTMETER MODEL AC-100A

AC-200A AC-200AR	DC-200A DC-200AR	AC-100A AC-100AR	DC-100A DC-100AR	DC-110A DC-110AR	VA-100A VA-100AR	VC-200A VC-200AR	C-100A C-100AR	C-200A C-200AR
0-1v, 10v, 100v, 1000v	0-1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v 0-.01 ma, .1 ma, 1 ma, 10 ma, 100 ma, 1 amp	0-1v, 10v, 100v, 1000v		
						0-1v, 10v, 100v, 1000v	0-10v	0-10v
0-10v, 100v, 1000v		0-10v, 100v, 1000v					0-10v, 100v, 1000v	0-10v, 100v, 1000v
0.01% +5 μv	0.01% +5 μv	0.05% +5 μv	0.05% +5 μv	0.025% +5 μv	0.05% +5 μv 0.1% +.001 μa	0.01% +5 μv		
0.15% 30 CPS—50 CPS 0.1% 50 CPS—5 KC 0.15% 5 KC—10 KC		0.2%					0.15%	0.15% 30 CPS—50 CPS 0.1% 50 CPS—10 KC 0.15% 10 KC—20 KC
30 CPS—10 KC		30 CPS—10 KC					30 CPS—10 KC	30 CPS—20 KC
0.001% per yr.	0.001% per yr.	0.01% per yr.	0.01% per yr.	0.005% per yr.	0.01% per yr.	0.001% per yr.	0.05% per 30 days	0.025% per 30 days
6	6	5	5	5	5	6*		
A—12"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—12"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 7"h. x 6"d.	A—17"w. x 7"h. x 12"d. AR—19"w. x 7"h. x 12"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 5¼"h. x 6"d.	A—8"w. x 7"h. x 6"d. AR—19"w. x 3½"h. x 6"d.
14 lbs.	12 lbs.	11 lbs.	9 lbs.	9 lbs.	7 lbs.	25 lbs.	7 lbs.	7 lbs.
A —$1425.00 AR—$1445.00	A —$965.00 AR—$985.00	A —$855.00 AR—$875.00	A —$475.00 AR—$495.00	A —$550.00 AR—$570.00	A —$625.00 AR—$645.00	A —$1440.00 AR—$1440.00	A —$535.00 AR—$555.00	A —$825.00 AR—$845.00

*6 Digit Readout As Voltmeter, 6 Digit Dialout As Power Supply.

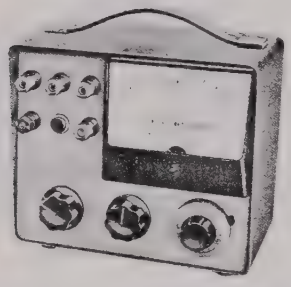
COMBINATION GALVANOMETER, POWER SUPPLY AND WHEATSTONE BRIDGE MODELS WB-100A and WB-110A



CSC's unique 3 in 1 combination offers users an unusually accurate, ultra-sensitive Wheatstone Bridge, all transistorized chopper readout amplifier and a bridge voltage power supply in a single, compact, lightweight and portable instrument for laboratory and production line test. Priced below competitive instruments, both the Model WB-100A and WB-110A provide High Resolution and a 5 digit readout over the full range. The instruments can be used as resistance comparators. They are available in both cabinet and rack mount.

ACCURACY:
WB-100A: ±0.05% + .005 ohm absolute.
WB-110A: ±.025% + .003 ohm absolute.
RANGE: 1 ohm to 100 megohms in 8 ranges.
SENSITIVITY: 1 mv for full scale.
READOUT: 5 digits.
INPUT VOLTAGE: 117 VAC, 50-60 cps.
WEIGHT: 8 lbs.
SIZE:
WB-100A & WB-110A: 8"w., 7"h., 6"d.
WB-100AR & WB-110AR: 19"w., 7"h., 6"d.
PRICE:
WB-100A: $575.00.
WB-100AR: $595.00.
WB-110A: $685.00.
WB-110AR: $705.00.

REGULATION MONITORS MODELS RM-2A, RM-2A-3, RM-2A-5



Designed specifically to measure the stability of any DC voltage from 2.0 volts to 500 volts, CSC's three Regulation Monitors read out directly in percent deviation. Drift is less than 0.005% for an 8 hour day and short term drift is less than 0.002%. At maximum sensitivity, the meter shows a full scale deflection for a deviation of ±0.1%. Fully transistorized for stable, reliable operation, the instruments incorporate ultra-stable Zener References and precision, aged wire-wound resistors. Sensitivity Range is ±0.001% to ±10% in 3 ranges, ±.1% F.S., ±1% F.S., and ±10% F.S. Major applications include check out of regulated DC power supplies, drift measurement of equipment during environmental test and design, performance and drift measurement of such components as zener diodes, transistors, gas filled regulators, batteries and resistors and in repair and calibration laboratories to trouble shoot drift problems in electronic instruments and systems.

TEMPERATURE STABILITY: ±0.0005% /°C from 10-40°C.
SENSITIVITY: .1%, 1%, 10% full scale.
VOLTAGE RANGE:
RM-2A: 2-500 VDC.
RM-2A-3: 2-3000 VDC.
RM-2A-5: 2-5000 VDC.
CALIBRATION ACCURACY: ±5% of reading + one small scale division on all ranges.
SMALLEST READABLE DEVIATION: 0.001%.
INPUT RESISTANCE: 7000 ohms per volt or greater.

RM-2A:	15 volt range	100K
	50 volt range	350K
	150 volt range	1.1 meg.
	500 volt range	3.5 meg.
RM-2A-3:	3000 volt range	21.0 meg.
RM-2A-5:	5000 volt range	35.0 meg.

STABILITY: Less than 0.005% change from 100 to 130 VAC.
WEIGHT:
RM-2A: 7 lbs.
RM-2A-3: 8 lbs.
RM-2A-5: 8 lbs.
SIZE:
RM-2A, RM-2A-3 & RM-2A-5: 8"w., 7"h., 6"d.
RM-2AR, RM-2AR-3 & RM-2AR-5: 19"w., 7"h., 6"d.
PRICE:

RM-2A:	$390.00.
RM-2AR:	$410.00.
RM-2A-3:	$485.00.
RM-2AR-3:	$505.00.
RM-2A-5:	$595.00.
RM-2AR-5:	$615.00.

Calibration Standards Corporation designs and manufactures Self-Calibrating, Transistorized Precision Electronic Instruments for Industry including . . .

AC and DC Precision Voltmeters that combine extremely wide measurement ranges with Accuracies of ±0.1% absolute (.5-1000 VAC), ±0.01% + 5 microvolts absolute (0-1000 VDC) and Stability of ±0.005%/yr.

Dual Purpose Voltage Calibrators that provide 0-1000 VDC as a Power Supply and measure 0-1000 VDC with Accuracies of ±0.01% and Stability of ±0.005%/yr.

Combination Volt-Amp meters accurate to ±0.05% (0-1000 volts) and ±0.1% (0-1 amp).

Unique, ultra-sensitive Galvanometer, Power Supply and Wheatstone Bridge in a single package.

Voltage Regulation Monitors to measure voltage stability and to final check DC regulated power supplies.

Primary Voltage References with Guaranteed Stability of 2PPM/3 months, 3PPM/yr. and Accuracy of ±0.0015%.

All Accuracies are of reading, not full scale.

CALIBRATION > STANDARDS CORPORATION

A subsidiary of ROYAL INDUSTRIES, INC.
1031 Westminster Avenue
Alhambra, California

OPERATING INSTRUCTIONS

1. The line cord should be plugged into a 117 volt 60 cycle power source.
2. Turn the null selector to the VTVM position. Let warm up for about ten minutes.
3. After warm up period, adjust meter to zero by mechanically adjusting the screw in the center of the meter case.
4. Turn the range selector knob to the desired range. Connect the voltage to be measured to the terminal posts. Either positive or negative may be grounded to the common terminal. If desired, the input may be left floating above ground.
5. The voltage now indicated on the meter is accurate within 4%. It is providing typical VTVM measurements. If the meter needle swings to the left, reverse the input connections.
6. Position first two readout dials to the approximate VTVM voltage reading. Advance the null selector knob to the 1 V position. Continue to adjust the readout while increasing the null sensitivity. You are now zeroing in on the null.
7. When, by the procedure above, the null selector is at full sensitivity (1 MV) and the meter reading zero, the voltage now read from the dials is accurate to better than .01% plus 5 microvolts absolute. You may not get a reading of zero if the voltage you are measuring is not constant and fluctuating.

Operating Instructions - (Cont'd.)

READING EXCURSIONS ABOUT A NOMINAL VOLTAGE

8. To read excursions of voltage about a nominal value, set the readout dials to the nominal value. Excursions may be observed directly on the meter on any of the four null ranges. A right hand deflection of the meter indicates the voltage has increased above the nominal value by the amount indicated on the meter. For voltages read on the 10 volt range and below, use null sensitivity selector as marked. On the 100 volt ranges, the null sensitivity selector value must be multiplied by a factor of 100.

DIRECT MEASUREMENTS OF 10 VOLTS AND ABOVE

9. With the range selector in the 10 volt position, use full scale values as marked on the meter. When range selector is in the 100 volt position, multiply the meter reading by 10. On the 1000 volt range, multiply the reading by 100.

VARIATIONS IN NULL DETECTOR SENSITIVITY

9A. Due to the circuit design on the 100 volt range, the null detector will have reduced sensitivity on the 1 mv and 10 mv position. This is due to a high internal source impedance of the high voltage input divider. The sensitivity is about 50%

Operating Instructions - (Cont'd.)

less in the 1 mv null position and about 15% less on the 10 mv position. Only a very slight loss of sensitivity is noticed on the other null ranges.

When the range selector is in the 1000 volt position a 10% loss of sensitivity will be noticed in the 1 mv position. The other null ranges will have only a very slight loss of sensitivity.

MEASUREMENTS BELOW 1 VOLT IN DIFFERENTIAL MODE

10. When making measurements below 1 volt, turn Range Selector switch to the 1 volt position; set null selector to the 1 mv position; set all readout dials to zero and short positive and negative input terminals together.

11. Now set the mechanical meter adjustment to zero. This will cancel out error due to zero offset between the 1 millivolt range and the V.T.V.M. range. Remove short across terminals and proceed with the reading of voltage per paragraphs 4, 5, 6, and 7.

CIRCUIT DESCRIPTION

This Calibration Standards Voltmeter is completely transistorized and designed for long trouble free life. There are no batteries or components that would normally need replacing, except the electro-mechanical chopper.

This dependable voltmeter operates on the principle of comparing an unknown voltage with an adjustable known voltage. A sensitive null detector is used to provide a means of sensing when the known and unknown voltages are equal.

This Calibration Standards voltmeter is composed of three (3) basic elements:

(1) Ultra Stable Reference Supply

(2) Accurate Kelvin Varley Divider

(3) Sensitive Null Detector

1. The heart of the voltmeter is the ultra stable reference voltage supply. This supply is a dual regulated transistor supply powering a compensated Zener reference string. The regulation for a 10% line change is better than -.001%. The temperature coefficient of the reference supply is better than .0002%/^{o} C. over a temperature range of 10^{o} C to 40^{o} C. The supply is usable above 40^{o} C with a slight derating of TC and line voltage regulation. Long term stability of the reference supply is

Circuit Description - (Cont'd.)

approximately ±.001%/year. This reference voltage supply is constructed as a plug-in module. Spares and replacements are available from the factory. When ordering be sure to indicate the serial number of the instrument.

2. The second basic element is the very accurate Kelvin Varley Divider. The first three decks are composed of 11 precision wire wound resistors per deck.

The first deck has resistors matched to -.001% and the second and third decks have resistors matched to ±.003%. The last three readouts are accomplished with a selected precision 10 turn potentiometer. The linearity of this potentiometer is better than ±.05%. The two decks and the 10 turn potentiometer are matched together to produce an over-all divider accuracy better than ±.002% absolute. A calibration curve is provided showing the exact linearity of the Calibration Standards Kelvin Varley Readout. (See Drawing Number A-1071).

The range selector precedes the Kelvin Varley Divider. Each range has a fine adjustment potentiometer for calibration; each is calibrated separately. The 10 volt range must be calibrated first.

3. The third element is a very sensitive and stable calibrated null

Circuit Description - (Cont'd.)

detector. This null detector is used to indicate the difference between the unknown external voltage and known internal voltage. At maximum sensitivity the null detector has a full scale deflection of 1 mv. This provides ample sensitivity for accurate low level voltage measurements. The VTVM accuracy is ±4% of full scale over a temperature range of 20° C to 30° C. The instrument is usable to 40° C. but some derating should be considered.

It is not recommended that the instrument be operated above 45° C.

The null detector is capable of a long trouble free life except for the occasional replacement of the chopper. These are highly reliable, however, do occasionally need replacement. These are available from stock at the factory. The occasional calibration of the null detector may be made by adjusting the gain adjustment potentiometer at the top of the plug-in amplifier module.

The null detector is capable of large overloads without damage. On the 1 mv range a safe overload would be 50 volts short term and 10 volts long term. On the 10 mv, 100 mv, and 1 V positions, a safe overload of 500 volts is possible.

Circuit Description - (Cont'd.)

In the VTVM position ranges, safe overloads are as follows:

1	volt range:	70	volts
10	volt range:	250	volts
100	volt range:	700	volts
1000	volt range:	1500	volts

CALIBRATION OF DC-200AR

Diagram A 1078 in this manual shows a setup for calibrating the DC-200AR Voltmeter.

A. Calibration of the Differential Section

The "RANGE SELECTOR" - "10V" and "1V" ranges are calibrated first. On these ranges the instrument has an infinite input resistance at null.

1. Turn instrument on and let warm up for about 30 minutes.

2. Next, turn "NULL SELECTOR" to the VTVM position and zero the meter by the mechanical adjustment screw on the meter.

3. Apply a known 10-volt calibration voltage across the "POS" and "NEG" input terminals. The instrument meter should read full scale. (See Drawing Number A-1078). Turn "READOUT" dials to read 999100 and turn "NULL SELECTOR" switch to the "1 MV" position. Bring meter to zero by adjusting the appropriate calibration trim potentiometer. (See Drawing Number A-1071).

4. Repeat the basic procedure for calibration of the "1 V" range using a known 1 volt.

Calibration of DC-200AR - (Cont'd.)

The "RANGE SELECTOR" - "100V" and "1000V" ranges are calibrated next. On these ranges the instrument has a 2 megohm input resistance.

5. Turn the "RANGE SELECTOR" switch to the "100V" position and apply a known 100 volt calibration voltage at meter input. Continue basic calibration procedure outlined in paragraph 3.
   NOTE: Multiply "NULL SELECTOR" ranges by 10.

6. Turn the "RANGE SELECTOR" switch to the "1000V" position. Apply a known 500 volts with the "READOUT" dials turned to 500.000. Bring meter to zero by adjusting the appropriate trim potentiometer.

B. Calibration of the VTVM Ranges

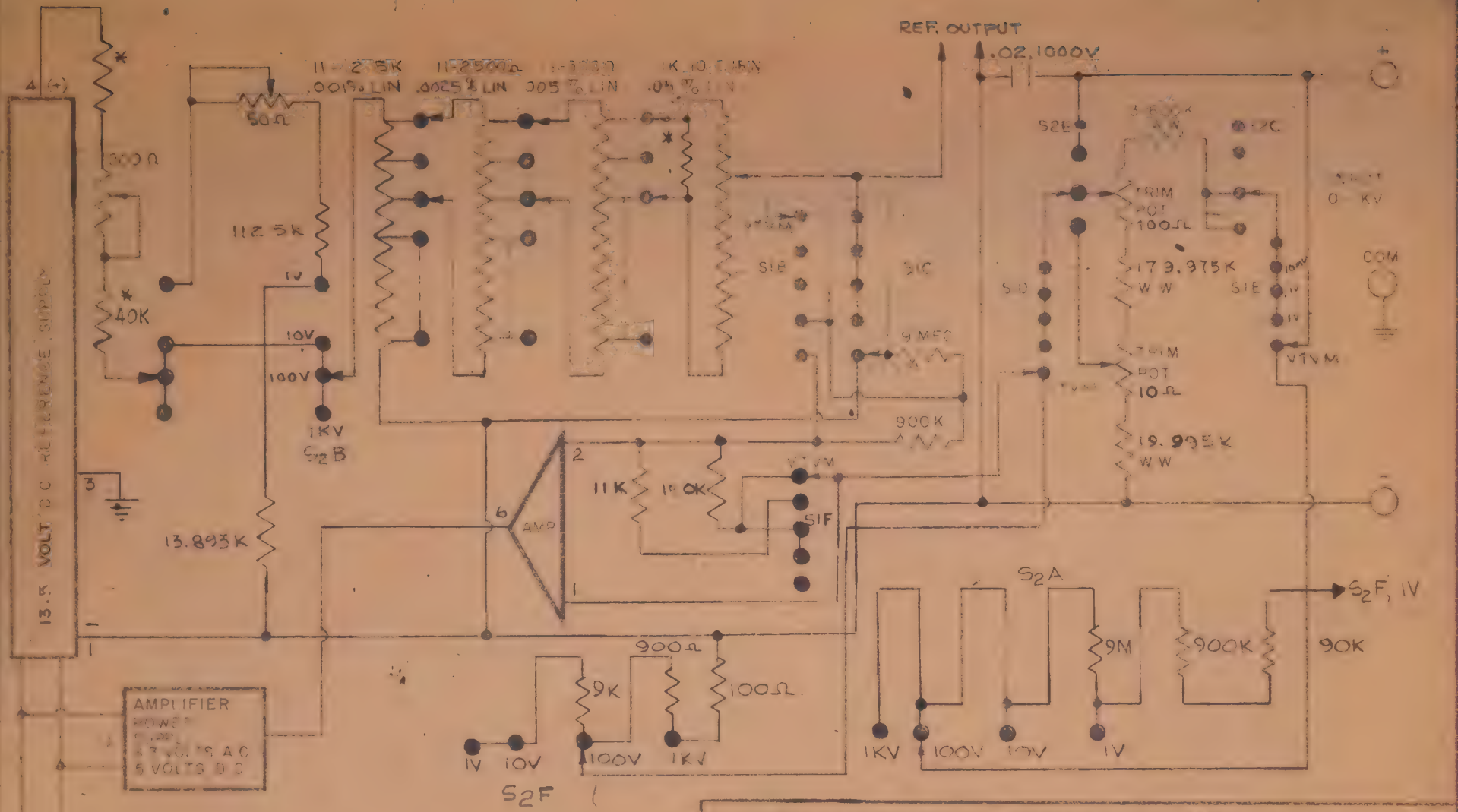
Calibrate the VTVM Ranges by setting the "RANGE SELECTOR" switch to the "10V" position and apply a known 10 volt calibration voltage. Adjust the potentiometer at the top of the amplifier plug-in module for full scale deflection. It is not necessary to calibrate the remaining VTVM ranges.

WARRANTY

The CALIBRATION STANDARDS CORPORATION warrants each instrument to be free from defects in material and workmanship. Material not covered by this warranty are fuses and choppers. The instrument must be returned to the factory with shipping prepaid and a complete report of the difficulty. This warranty is good for one year from the shipping date.

SHIPPING DAMAGE

If there is any damage to the instrument upon receipt, report this to the transportation Claim Agent immediately.



FACTORY SELECTED

CALIBRATION STANDARDS CORPORATION

ALHAMBRA — CALIFORNIA

SCALE NONE	APPROVED BY	MAT. APPROVED
DATE	RED BY	REVISED

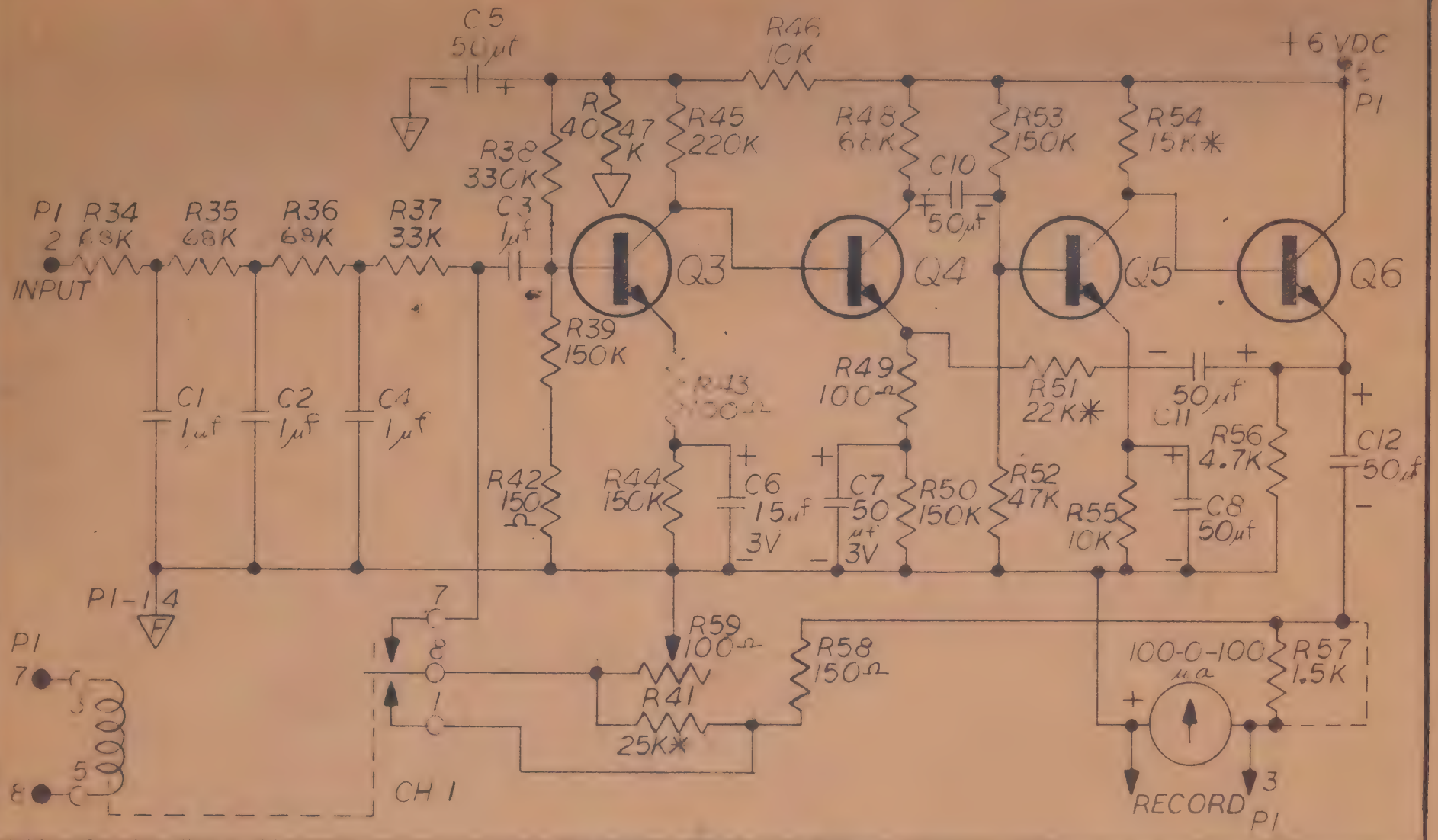
DC-200AR, BASIC SCHEMATIC DIAGRAM

PRECISION D.C. VOLTMETER

DRAWING NUMBER 340-019 | ISSUE C

DWG. NO. 340-029 | ISSUE B | THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALIBRATION STANDARDS CORPORATION AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT PERMISSION.

CHANGE	DATE	ISSUE	BY	APP



* VALUE MAY CHANGE FOR DIFFERENT GAIN.

TOLERANCES EXCEPT AS SHOWN	DATE: 6-18-62
FRACTION ±	DWN: CA BIBB
DECIMAL ±	CHKD:
ANGLES ±	APPD: H. L. Ford
	SCALE:

CALIBRATION STANDARDS CORPORATION
POMONA — CALIFORNIA

TITLE: SCHEMATIC AMPLIFIER NO. 4

NEXT ASSEMBLY

USED ON:

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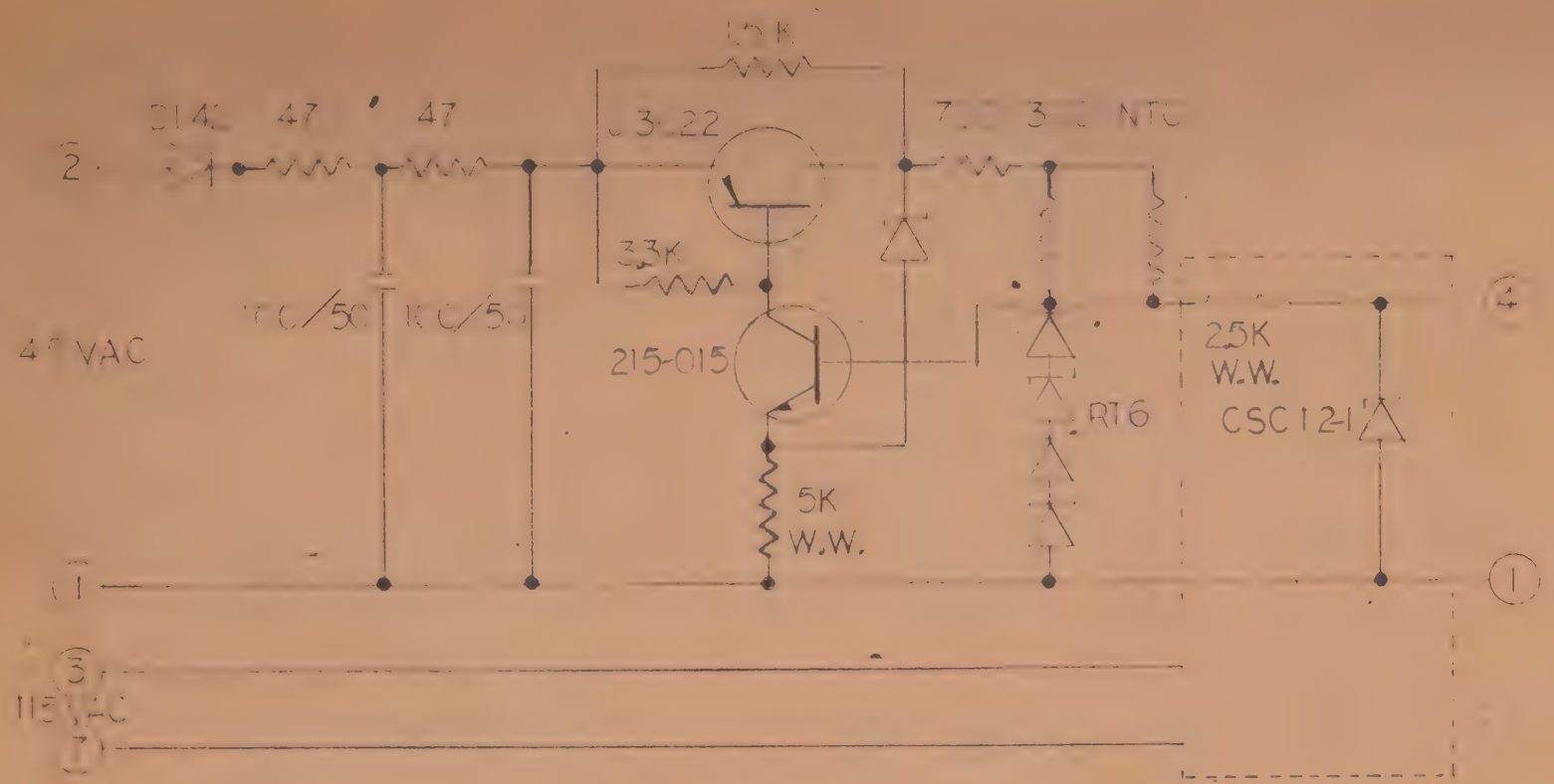


			TOLERANCES. EXCEPT AS SHOWN:	DATE: 4/27/66	CALIBRATION STANDARDS CORPORATION
			FRACTION ±	DWN. D.L.W.	POMONA — CALIFORNIA
			DECIMAL ±	CHK'D: D.L.W.	TITLE. OVEN REGULATOR REFERENCE
			ANGLES ±	APP'D: D.L.W.	NEXT ASSEMBLY. USED ON.
	MATERIAL	QTY		SCALE	DRAWING NO. 525-118 ISSUE A

DWG. NO. 340-027 | A | THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALIBRATION STANDARDS CORPORATION AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT PERMISSION.

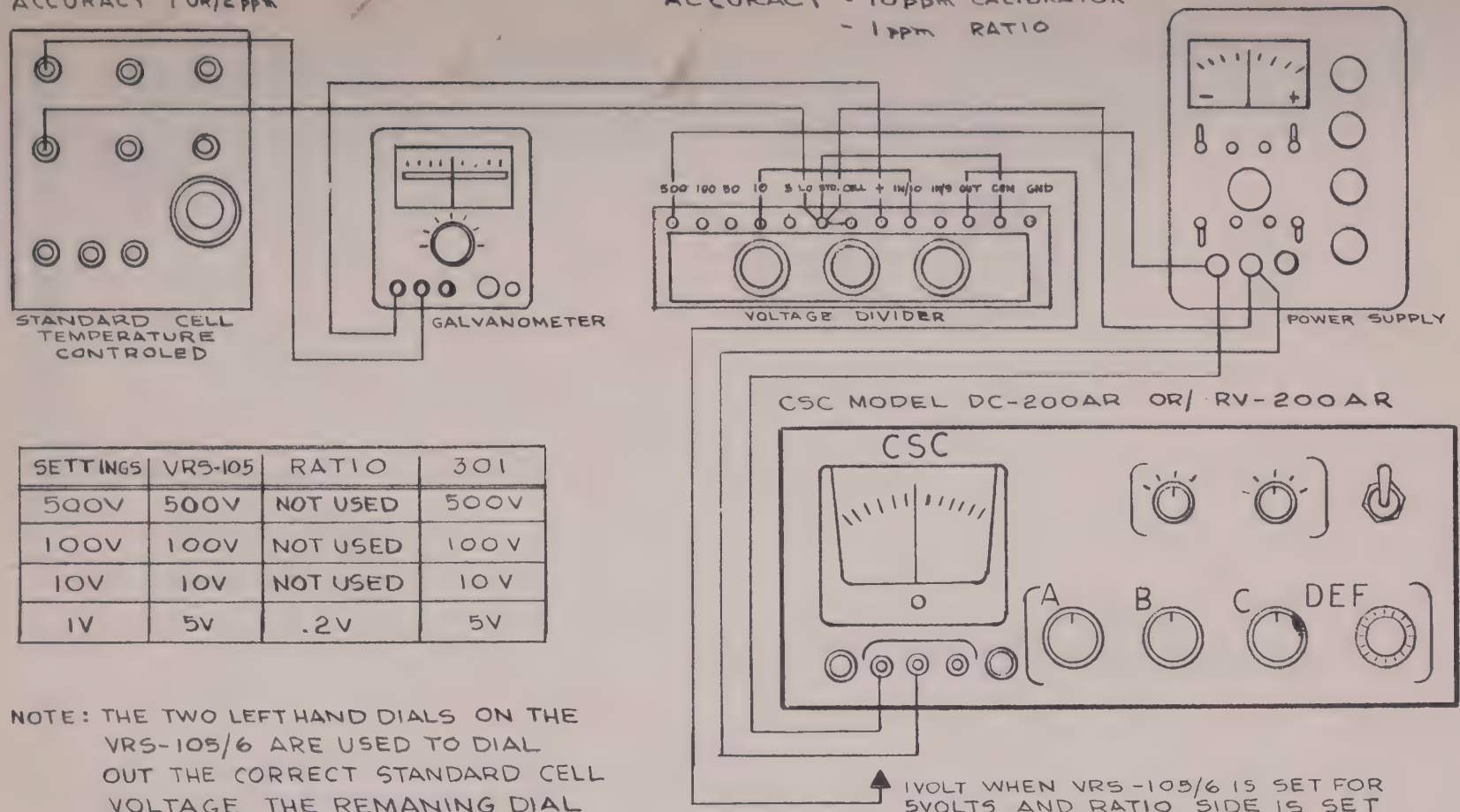
CHANGE	DATE	ISSUE	BY	APP.

JULIE RESEARCH LABS
MODEL SCO-106
ACCURACY 1 OR/2 ppm

HP425AR

JULIE RESEARCH LABS
MODEL VRS-105/6
ACCURACY - 10ppm CALIBRATOR
- 1ppm RATIO

KIN TEL
MODEL 301



SETTINGS	VRS-105	RATIO	301
500V	500V	NOT USED	500V
100V	100V	NOT USED	100V
10V	10V	NOT USED	10V
1V	5V	.2V	5V

NOTE: THE TWO LEFT HAND DIALS ON THE VRS-105/6 ARE USED TO DIAL OUT THE CORRECT STANDARD CELL VOLTAGE. THE REMANING DIAL IS FOR RATIO VOLTAGES

DET.	MATERIAL	QTY.

TOLERANCES: EXCEPT AS SHOWN:
FRACTION ±
DECIMAL ±
ANGLES ±

DATE: 12-26-60
DWN: WJF
CHKD:
APPD:
SCALE:

CALIBRATION STANDARDS CORPORATION
ALHAMBRA — CALIFORNIA

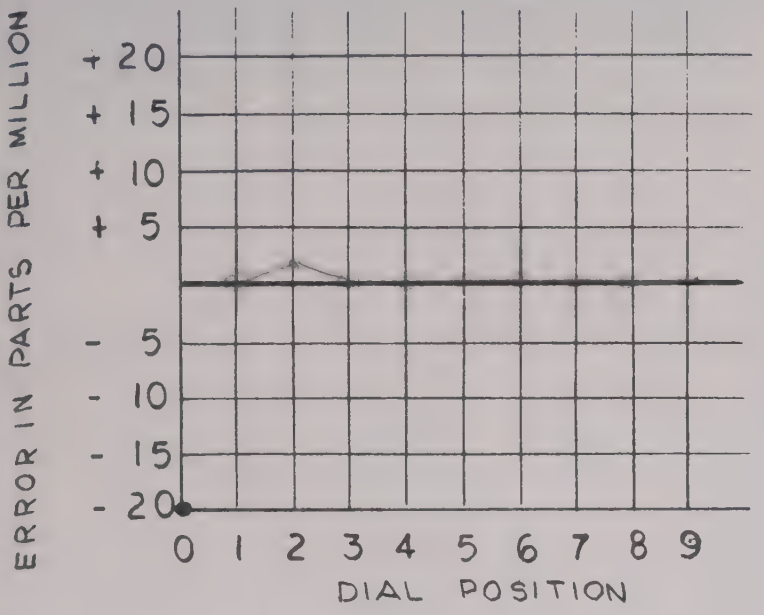
TITLE: AC/DC/RV-200AR, CALIBRATION —

NEXT ASSEMBLY:
USED ON:

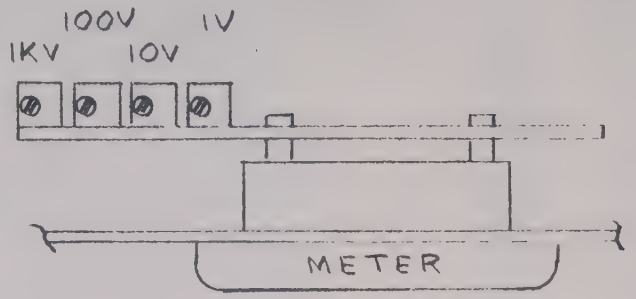
DRAWING NO. 340-027 | ISSUE A

DWG. NO. 340-023 | ISSUE N/C | THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALIBRATION STANDARDS CORPORATION AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT PERMISSION.

CHANGE	DATE	ISSUE	BY	APP.



CALIBRATION ADJUSTMENTS



INSTRUMENT SERIAL # SR-194

KELVIN VARLEY DIVIDER CALIBRATION
CHECKED AGAINST OUR 1 PPM MASTER DIVIDER

DET.	MATERIAL	QTY.

TOLERANCES: EXCEPT AS SHOWN:
FRACTION ±
DECIMAL ±
ANGLES ±

DATE:
DWN:
CHKD:
APPD:
SCALE:

CALIBRATION STANDARDS CORPORATION
POMONA — CALIFORNIA

TITLE: DC200-AR CALIBRATION CHART

NEXT ASSEMBLY:
USED ON:

DRAWING NO. 340-023 | ISSUE N/C

Calibration Standards Corporation

A subsidiary of ROYAL > INDUSTRIES, INC.

Model DC-200AR
VOLTMETER
Model RV-200AR
RATIOMETER - VOLTMETER

Calibration Standards Corporation

PRECISION DC VOLTMETER

FULLY TRANSISTORIZED

ACCURACY

±0.01% + 5 microvolts absolute from 0 to 1000 volts D.C.
±0.003% typical accuracy

STABILITY

±.001% for a 10% line voltage change.

- **Transistorized throughout, no vacuum tubes or batteries.**
- **6 digit readout.**
- **10 ppm/year stability of wire wound resistors.**
- **10 ppm/year stability of Zener reference supply.**
- **Recorder Output (25mv).**
- **0-10 volts output from Kelvin Varley divider.**

GENERAL DESCRIPTION

The Model **DC-200AR D.C. VOLTMETER** is designed to measure D.C. voltages to an accuracy of better than ±0.01%. Below 10 volts the instrument has an infinite input resistance at null. Above 10 volts the input resistance is 2 megohms.

This instrument provides 6 digit readout with near infinite resolution.

The Model RV-200AR is identical to the DC-200AR except that D.C. ratio measurements can also be made.

PRECISION D.C. VOLTMETER

Calibration Standards Corporation

ELECTRONIC INSTRUMENTATION FOR INDUSTRY

A subsidiary of ROYAL > INDUSTRIES, INC.

DC-200AR
RV-200AR

MODELS DC-200AR - RV-200AR

VOLTMETER RATIOMETER - VOLTMETER

SPECIFICATIONS

DC-200AR VOLTMETER

VTVM RANGES	0-1v., 0-10v., 0-100v., 0-1000v. full scale.
NULL RANGES	0-1mv., 0-10mv., 0-100mv., 0-1 volt full scale. (Times 10 on the 100 volt range.) (Times 100 on the 1000 volt range.)
ACCURACY of PRECISION RANGES	±0.01% + 5 microvolts absolute from 0 to 1000 volts D.C.
POTENTIOMETER ACCURACY	±0.002%.
ACCURACY of VTVM	±4% of full scale.
INPUT RESISTANCE	Infinite at null below 10 volts, 2 megohms above 10 volts. VTVM Resistance — 1000 volts, 100 volts, 10 volts } 10 megohms 1 volt — 1 megohm 100 megohms/volt on null ranges except 1 volt null range — 10 megohms. When KVD dials set to zero.
STABILITY of REFERENCE	±0.001% for a 10% line change. ±0.0002% (2 PPM)/°C over a temperature range of 10°C to 40°C.
WARMUP	Less than 10 min. for 0.02% accuracy. Less than 30 min. for 0.01% accuracy.
INPUT LINE VOLTAGE	117 v.a.c. 60 c.p.s. — 50-400 c.p.s. operation is available for all instruments for an additional $60.00.
INPUT POWER	Less than 3 watts.
WEIGHT and SIZE	12 Lbs. 19"w. x 7"h. x 6"d.
PRICE	Rack Model $985.00. Cabinet Model $965.00 F.O.B. Alhambra, California.

RV-200AR RATIOMETER - VOLTMETER

VOLTMETER SPECIFICATIONS	Same as DC-200AR.
RATIO RANGES	x1 = 1:1 to 10:1. x10 = 10:1 to 100:1. x100 = 100:1 to 1000:1.
RATIO ACCURACY	±0.005% + 5 microvolts for ratio of 1:1 to 1000:1 over a voltage range of 0-300 volts D.C.
PRICE	Rack Model $1145.00. Cabinet Model $1125.00 F.O.B. Alhambra, California.

The **MODEL DC-200AR** and **MODEL RV-200AR** are very precise measuring instruments. Only the highest stability precision wire wound resistors are used in critical circuits. These resistors are stable to ±10 ppm/year due to our long term temperature cycling. The Zener reference supply is stable to approximately ±10 ppm/year. The Zener reference elements are aged for 1000 hours before installation into the instruments.

The **MODEL RV-200AR** measures both D.C. voltages and D.C. ratios. Both instruments offer 6 digit readout.

Calibration Standards Corporation

1031 WESTMINSTER AVENUE
POST OFFICE BOX 551
ALHAMBRA, CALIFORNIA

A subsidiary of ROYAL INDUSTRIES, INC.

PRECISION VOLTMETER

SHORT CATALOG

CONTINUOUSLY SELF-CALIBRATING

ACCURACIES OF READING, NOT FULL SCALE

ULTRA-STABLE ZENER REFERENCES

5 & 6 DIGIT READOUTS

NO ZERO CONTROLS

ALL TRANSISTORIZED

RACK AND CABINET MODELS

LIGHTWEIGHT

PLUG-IN MODULES

LOW POWER CONSUMPTION

0—1000 VDC
.05—1000 VAC

ULTRA-STABLE KELVIN-VARLEY DIVIDER

±1 MILLIVOLT NULL SENSITIVITY

COMPACT, PORTABLE

CALIBRATED BY PRIMARY STANDARDS

INFINITE INPUT IMPEDANCE

PRECISION, AGED RESISTORS

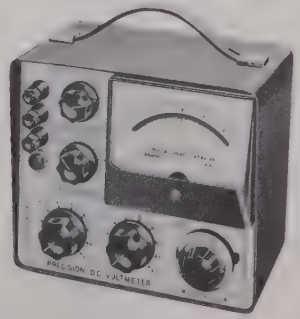
CALIBRATION > STANDARDS CORPORATION

ALL CALIBRATION STANDARDS PRECISION VOLTMETERS

INCORPORATE THESE OUTSTANDING FEATURES

- Continuously Self-Calibrating (60 times per second)
- Ultra-Stable Zener References (Series 200 Instruments, 0.001%/year, 0.001% for 10% line change, 2PPM/°C; Series 100 Instruments, 0.01%/year, 0.005% for 10% line change, 5PPM/°C; Series 110 Instruments, 0.005%/year, 0.005% for 10% line change, 3PPM/°C)
- Precision selected and aged wire-wound resistors with stability of 0.001%/year (Series 200) and 0.005%/year (Series 100)
- No Zero Controls necessary
- No Calibration Controls necessary
- Lightweight, Compact, Portable
- All Transistorized
- Low Power consumption
- All Accuracies stated are of reading, not full scale
- Measurement Ranges of 0 to 1000 volts DC and .05 to 1000 volts AC
- 6 digit readout for Series 200 Instruments, 5 digit readout for Series 100 Instruments
- Most sensitive Null range is ±1 millivolt for AC and DC measurements
- All instruments calibrated by Primary Standards with traceability to the Bureau of Standards
- Certificates supplied upon request
- All instruments available in cabinet and rack models
- Recorder output to facilitate long term strip chart recording
- Operation is the same for both AC and DC measurements
- Ultra-Stable Kelvin-Varley Divider
- Infinite Input Impedance
- Differential Input
- Plug-in Modules

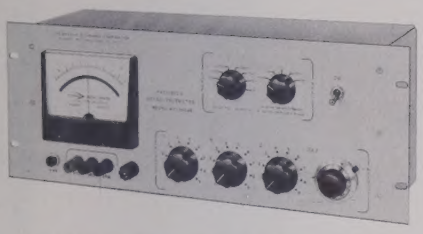
DC VOLTMETER MODEL DC-200A



DC VOLTMETER MODEL DC-110A

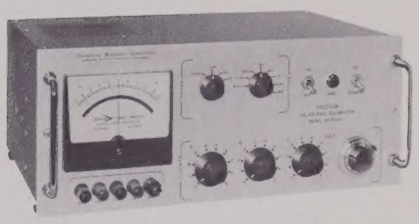
RANGES
DC Input
DC Output
AC Input
DC ACCURACY
AC ACCURACY
FREQUENCY
STABILITY OF REFERENCE
NO. OF DIGITS
SIZE
WEIGHT
PRICE

PRECISION ELECTRONIC INSTRUMENTS FOR INDUSTRY

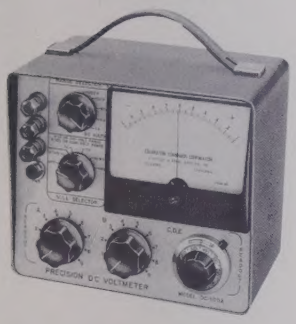


AC/DC VOLTMETER MODEL AC-200AR

AC/DC CONVERTER MODEL C-100AR



DC VOLTAGE CALIBRATOR MODEL VC-200A



DC VOLTMETER MODEL DC-100A

DC VOLT-AMP METER MODEL VA-100A

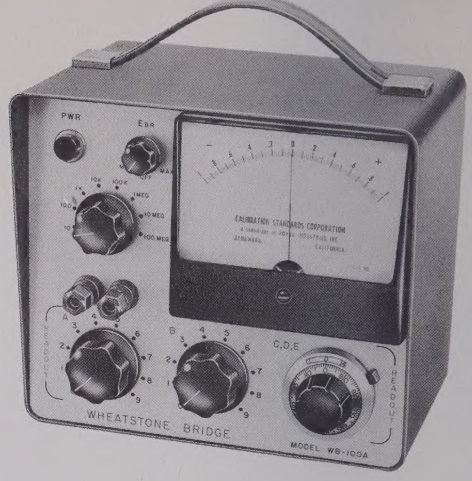
AC/DC VOLTMETER MODEL AC-100A

AC-200A AC-200AR	DC-200A DC-200AR	AC-100A AC-100AR	DC-100A DC-100AR	DC-110A DC-110AR	VA-100A VA-100AR	VC-200A VC-200AR	C-100A C-100AR	C-200A C-200AR
0-1v, 10v, 100v, 1000v	0-1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v	0-.1v, 1v, 10v, 100v, 1000v 0-.01 ma, .1 ma, 1 ma, 10 ma, 100 ma, 1 amp	0-1v, 10v, 100v, 1000v		
						0-1v, 10v, 100v, 1000v	0-10v	0-10v
0-10v, 100v, 1000v		0-10v, 100v, 1000v					0-10v, 100v, 1000v	0-10v, 100v, 1000v
0.01% +5 μv	0.01% +5 μv	0.05% +5 μv	0.05% +5 μv	0.025% +5 μv	0.05% +5 μv 0.1% +.001 μa	0.01% +5 μv		
0.15% 30 CPS–50 CPS 0.1% 50 CPS–5 KC 0.15% 5 KC–10 KC		0.2%					0.15%	0.15% 30 CPS–50 CPS 0.1% 50 CPS–10 KC 0.15% 10 KC–20 KC
30 CPS–10 KC		30 CPS–10 KC					30 CPS–10 KC	30 CPS–20 KC
0.001% per yr.	0.001% per yr.	0.01% per yr.	0.01% per yr.	0.005% per yr.	0.01% per yr.	0.001% per yr.	0.05% per 30 days	0.025% per 30 days
6	6	5	5	5	5	6*		
A–12"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–12"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 7"h. x 6"d.	A–17"w. x 7"h. x 12"d. AR–19"w. x 7"h. x 12"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 5¼"h. x 6"d.	A–8"w. x 7"h. x 6"d. AR–19"w. x 3½"h. x 6"d.
14 lbs.	12 lbs.	11 lbs.	9 lbs.	9 lbs.	7 lbs.	25 lbs.	7 lbs.	7 lbs.
A –$1425.00 AR–$1445.00	A –$965.00 AR–$985.00	A –$855.00 AR–$875.00	A –$475.00 AR–$495.00	A –$550.00 AR–$570.00	A –$625.00 AR–$645.00	A –$1440.00 AR–$1440.00	A –$535.00 AR–$555.00	A –$825.00 AR–$845.00

*6 Digit Readout As Voltmeter, 6 Digit Dialout As Power Supply.

COMBINATION GALVANOMETER, POWER SUPPLY AND WHEATSTONE BRIDGE MODELS WB-100A and WB-110A

CSC's unique 3 in 1 combination offers users an unusually accurate, ultra-sensitive Wheatstone Bridge, all transistorized chopper readout amplifier and a bridge voltage power supply in a single, compact, lightweight and portable instrument for laboratory and production line test. Priced below competitive instruments, both the Model WB-100A and WB-110A provide High Resolution and a 5 digit readout over the full range. The instruments can be used as resistance comparators. They are available in both cabinet and rack mount.



ACCURACY:
WB-100A: ±0.05% + .005 ohm absolute.
WB-110A: ±.025% + .003 ohm absolute.
RANGE: 1 ohm to 100 megohms in 8 ranges.
SENSITIVITY: 1 mv for full scale.
READOUT: 5 digits.
INPUT VOLTAGE: 117 VAC, 50-60 cps.
WEIGHT: 8 lbs.
SIZE:
WB-100A & WB-110A: 8"w., 7"h., 6"d.
WB-100AR & WB-110AR: 19"w., 7"h., 6"d.
PRICE:
WB-100A: $575.00.
WB-100AR: $595.00.
WB-110A: $685.00.
WB-110AR: $705.00.

REGULATION MONITORS MODELS RM-2A, RM-2A-3, RM-2A-5

Designed specifically to measure the stability of any DC voltage from 2.0 volts to 500 volts, CSC's three Regulation Monitors read out directly in percent deviation. Drift is less than 0.005% for an 8 hour day and short term drift is less than 0.002%. At maximum sensitivity, the meter shows a full scale deflection for a deviation of ±0.1%. Fully transistorized for stable, reliable operation, the instruments incorporate ultra-stable Zener References and precision, aged wire-wound resistors. Sensitivity Range is ±0.001% to ±10% in 3 ranges, ±.1% F.S., ±1% F.S., and ±10% F.S. Major applications include check out of regulated DC power supplies, drift measurement of equipment during environmental test and design, performance and drift measurement of such components as zener diodes, transistors, gas filled regulators, batteries and resistors and in repair and calibration laboratories to trouble shoot drift problems in electronic instruments and systems.

TEMPERATURE STABILITY: ±0.0005% /°C from 10-40°C.
SENSITIVITY: .1%, 1%, 10% full scale.
VOLTAGE RANGE:
RM-2A: 2-500 VDC.
RM-2A-3: 2-3000 VDC.
RM-2A-5: 2-5000 VDC.
CALIBRATION ACCURACY: ±5% of reading + one small scale division on all ranges.
SMALLEST READABLE DEVIATION: 0.001%.
INPUT RESISTANCE: 7000 ohms per volt or greater.

	15 volt range	100K
	50 volt range	350K
RM-2A:	150 volt range	1.1 meg.
	500 volt range	3.5 meg.
RM-2A-3:	3000 volt range	21.0 meg.
RM-2A-5:	5000 volt range	35.0 meg.

STABILITY: Less than 0.005% change from 100 to 130 VAC.
WEIGHT:
RM-2A: 7 lbs.
RM-2A-3: 8 lbs.
RM-2A-5: 8 lbs.
SIZE:
RM-2A, RM-2A-3 & RM-2A-5: 8"w., 7"h., 6"d.
RM-2AR, RM-2AR-3 & RM-2AR-5: 19"w., 7"h., 6"d.
PRICE:
RM-2A: $390.00.
RM-2AR: $410.00.
RM-2A-3: $485.00.
RM-2AR-3: $505.00.
RM-2A-5: $595.00.
RM-2AR-5: $615.00.

Calibration Standards Corporation designs and manufactures Self-Calibrating, Transistorized Precision Electronic Instruments for Industry including . . .

AC and DC Precision Voltmeters that combine extremely wide measurement ranges with Accuracies of ±0.1% absolute (.5-1000 VAC), ±0.01% + 5 microvolts absolute (0-1000 VDC) and Stability of ±0.005%/yr.

Dual Purpose Voltage Calibrators that provide 0-1000 VDC as a Power Supply and measure 0-1000 VDC with Accuracies of ±0.01% and Stability of ±0.005%/yr.

Combination Volt-Amp meters accurate to ±0.05% (0-1000 volts) and ±0.1% (0-1 amp).

Unique, ultra-sensitive Galvanometer, Power Supply and Wheatstone Bridge in a single package.

Voltage Regulation Monitors to measure voltage stability and to final check DC regulated power supplies.

Primary Voltage References with Guaranteed Stability of 2PPM/3 months, 3PPM/yr. and Accuracy of ±0.0015%.

All Accuracies are of reading, not full scale.

CALIBRATION > STANDARDS CORPORATION
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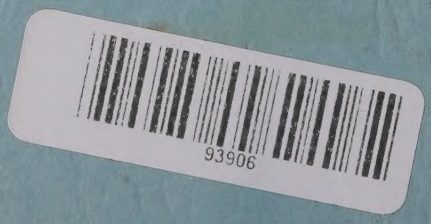
1031 Westminster Avenue
Alhambra, California



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